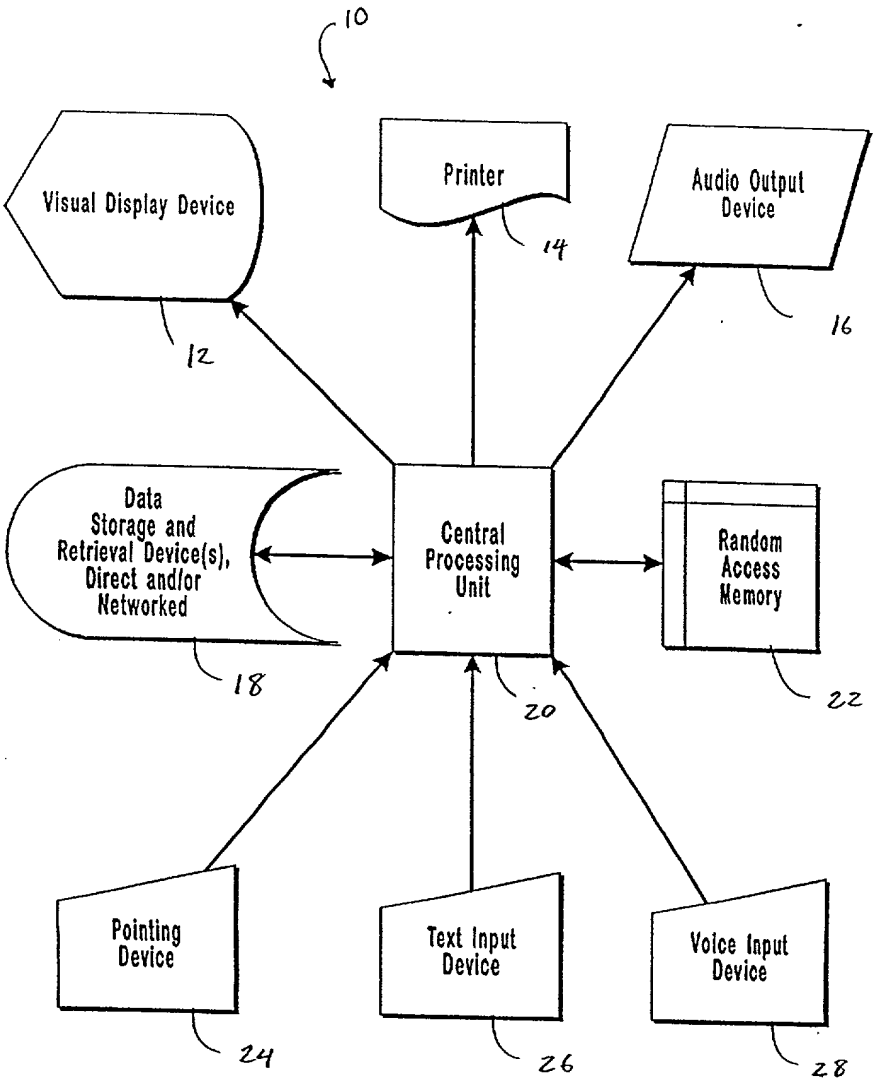

10
Visual Display Device
12
Printer
14
Audio Output Device
16
Data Storage and Retrieval Device(s), Direct and/or Networked
18
Central Processing Unit
20
Random Access Memory
22
Pointing Device
24
Text Input Device
26
Voice Input Device
28

FIG. 1

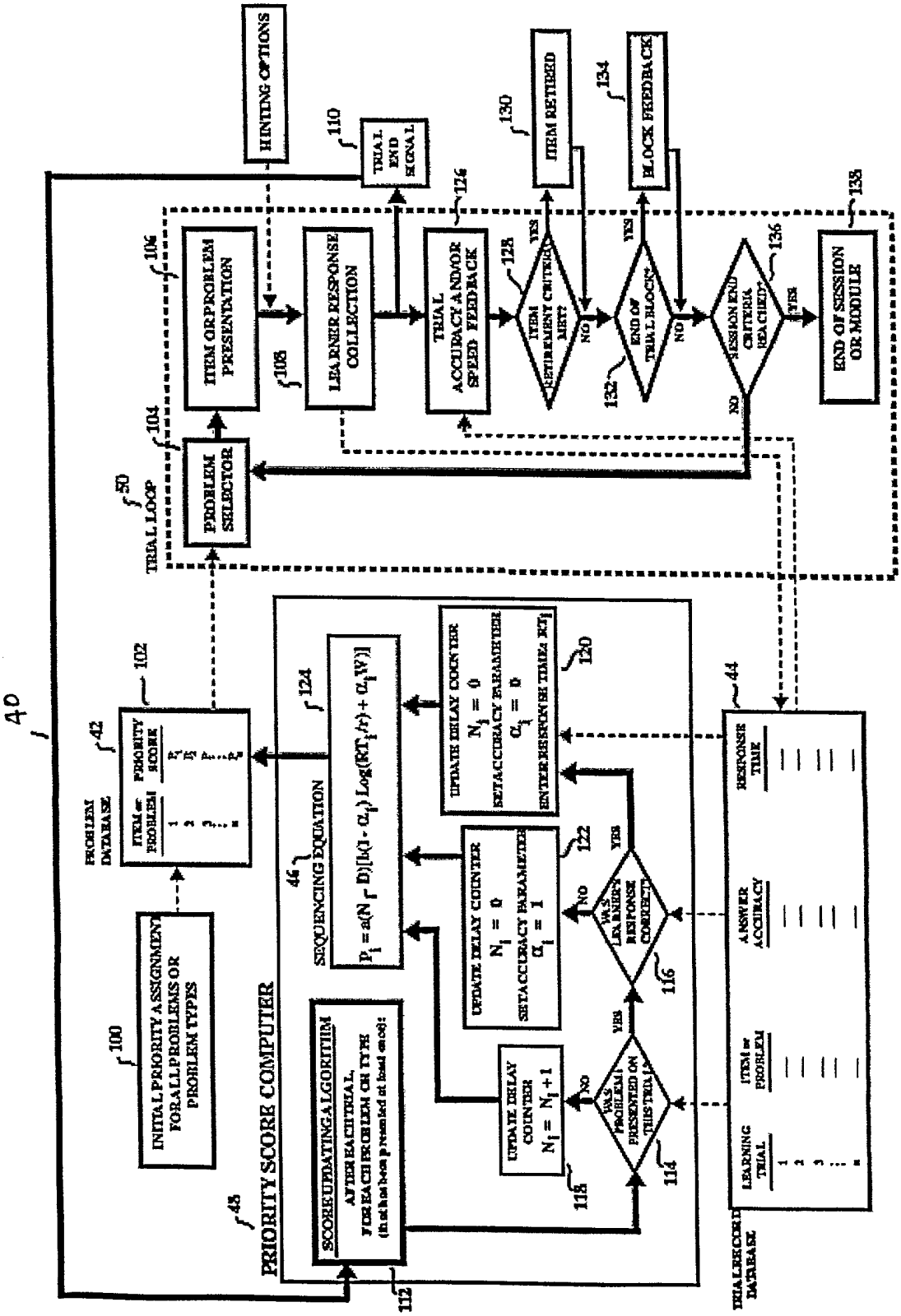


FIGURE 2. OPTIMAL SEQUENCING METHOD

TRIAL	PROBLEM	RESPONSE	RESPONSE ACCURACY	TIME (sec)	COMMENT
1	7 X 7 =	"49"	CORRECT	3.5	Fast, correct response.
2	6 X 7 =	"38"	WRONG	--	Incorrect response.
3	7 X 4 =	"28"	CORRECT	18.4	Correct but slow.
4	12 X 7 =	"72"	WRONG	--	
5	6 X 7 =	"42"	CORRECT	11.7	Recurrence of problem missed on Trial 2.
6	9 X 9 =	"72"	WRONG	--	
7	12 X 7 =	"84"	CORRECT	10.4	Recurrence of problem missed on Trial 4.
8	5 X 8 =	"40"	CORRECT	2.6	
9	9 X 9 =	"80"	WRONG	--	
10	7 X 4 =	"28"	CORRECT	6.1	Recurrence of problem answered slowly on Trial 3.
11	6 X 3 =	"18"	CORRECT	4.8	
12	9 X 9 =	"74"	WRONG	--	Recurrence of problem missed on Trial 9.
13	3 X 4 =	"12"	CORRECT	2.4	
14	6 X 7 =	"32"	WRONG	--	Recurrence of problem answered slowly on Trial 5.
15	9 X 9 =	"81"	CORRECT	4.5	Recurrence of problem missed on Trial 12.
16	7 X 7 =	"49"	CORRECT	2.7	Recurrence of problem answered quickly on Trial 1.
17	12 X 7 =	"84"	CORRECT	6.2	Recurrence of problem answered slowly on Trial 7.
18	6 X 7 =	"42"	CORRECT	5.1	Recurrence of problem missed on Trial 14.
19	3 X 10 =	"30"	CORRECT	3.2	
20	7 X 4 =	"28"	CORRECT	3.9	Recurrence of Trial 10 problem.

Table 1

Figure 3. Sample Sequence of Trials Using the Sequencing Algorithm. Relevant parameter values: a = .1, b = 2, D = 2, W = 12, K = 1. Arrows indicate selected examples of problem recurrence. (See text.)

PROBLEM	TRIAL 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
7X7=	(1)	-.088	0	.088	.176	.264	.352	.44	.528	.616	.704	.792	.88	.096	1.06	(1.14)	.075	.151	.226	.30
6X7=	1	(1)	-1.2	0	(1.2)	-.148	0	.148	.296	.444	.592	.74	.888	(1.04)	-1.2	0	1.2	(2.4)	.11	.22
7X4=	1	1	(1)	-.2	0	.202	.404	.606	.808	(1.01)	-.129	0	.129	.258	.387	.516	.645	.774	.903	(1.03)
12X7=	1	1	1	(1)	-1.2	0	(1.2)	-.158	0	.158	.316	.474	.632	.79	.948	1.10	(1.26)	.123	.245	.368
9X9=	1	1	1	1	1	(1)	-1.2	0	(1.2)	-1.2	0	(1.2)	-1.2	0	(1.2)	.102	.204	.307	.409	.511
5X8=	1	1	1	1	1	1	1	(1)	.07	.14	.21	.28	.35	.42	.49	.56	.63	.70	.77	.85
6X3=	1	1	1	1	1	1	1	1	1	1	(1)	.106	.212	.318	.424	.530	.636	.742	.848	.954
3X4=	1	1	1	1	1	1	1	1	1	1	1	1	(1)	.068	.137	.205	.273	.341	.409	.477
3X10=	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	(1)	.083
8X4=	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4X12=	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3X9=	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8X7=	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11x5=	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6X8=	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
⋮																				

Figure 4. Priority Scores by Trial for Sample Sequence in Figure 3. Columns indicate trials; rows show a partial list of problems in the database. Circled priority scores indicate the problem chosen by the algorithm for that trial Parameter values: a = .1; b=2; W=12; D=2; k=1; r=2.

TRIAL	PROBLEM	RESPONSE	RESPONSE ACCURACY	TIME (sec)	COMMENT
1	camino	"road"	CORRECT	3.5	Fast, correct response.
2	Martes	"March"	WRONG	--	Incorrect response.
3	dos	"two"	CORRECT	18.4	Correct but slow.
4	verde	"Don't know"	WRONG	--	
5	anaranjado	"angel"	WRONG	--	
6	Martes	"Tuesday"	CORRECT	15.0	Recurrence of problem missed o
7	Abril	"April"	CORRECT	10.4	
8	facil	"easy"	CORRECT	2.6	
9	verde	"green"	CORRECT	9.7	Recurrence of problem missed o
10	anaranjado	"apple"	WRONG	--	Recurrence of problem missed o
11	Viernes	"Friday"	CORRECT	4.8	
12	azul	"blue"	WRONG	--	
13	dos	"two"	CORRECT	2.4	Recurrence of problem answere
14	Noviembre	"November"	CORRECT	8.6	
15	anaranjado	"orange"	CORRECT	11.3	Recurrence of problem missed o
16	cero	"zero"	CORRECT	2.7	
17	camino	"road"	CORRECT	6.2	Recurrence of problem answere
18	Martes	"Tuesday"	CORRECT	5.1	Recurrence of problem answere
19	hija	"daughter"	CORRECT	3.2	
20	empujar	"orange"	WRONG	--	

Figure 5. Sample Sequence of Trials Using the Sequencing Algorithm with Parameters Set to Favor Introduction of Relevant parameter values: a = .1, b = 1.5, D = 2, r=2, W = 6, K = 1.2.

	TRIAL																			
PROBLEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
camino	(1.2)	-.09	0	.09	.18	.27	.37	.46	.55	.64	.73	.82	.92	1.01	1.1	1.19	(1.28)	-.09	0	.09
Martes	1.2	(1.2)	-0.6	0	0.6	(1.2)	-0.14	0	.14	.28	.42	.56	.70	.84	.98	1.11	1.25	(1.39)	-.08	0
dos	1.2	1.2	(1.2)	-0.16	0	.16	.32	.49	.65	.81	.97	1.13	(1.3)	-.12	0	.12	.25	.37	.49	.61
verde	1.2	1.2	1.2	(1.2)	-0.6	0	.6	1.2	(1.8)	-0.12	0	-0.12	.23	.345	.46	.58	.69	.81	.92	1.04
anaranjado	1.2	1.2	1.2	1.2	(1.2)	-0.6	0	.6	1.2	(1.8)	-0.6	0	.6	1.2	(1.8)	-.12	0	.12	.25	.37
Abril	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)	-.08	0	.08	.17	.25	.34	.42	.51	.59	.68	.76	.85	.93
facil	1.2	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)	-.09	0	.09	.18	.27	.37	.46	.55	.64	.73	.82	.92
Viernes	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)	-0.16	0	.16	.33	.49	.66	.82	.99	1.15
azul	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)	-.07	0	.07	.13	.20	.26	.33	.40
Noviembre	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)	-0.11	0	.11	.22	.33	.44
cero	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)	-.09	0	.09	.19
hija	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)	-0.6
empujar	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	(1.2)
amarillo	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Lunes	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
rosado	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

FIGURE 6. Priority Scores by Trial for Sample Sequence in Figure 5. Columns indicate trials; rows show a partial list of problems in the database. Circled priority scores indicate the problem chosen by the algorithm for that trial. Parameter values: a = .1; b=1.5; W=6; D=2; k=1.2; r=2.

FIGURE 7. PERCEPTUAL LEARNING MODULE

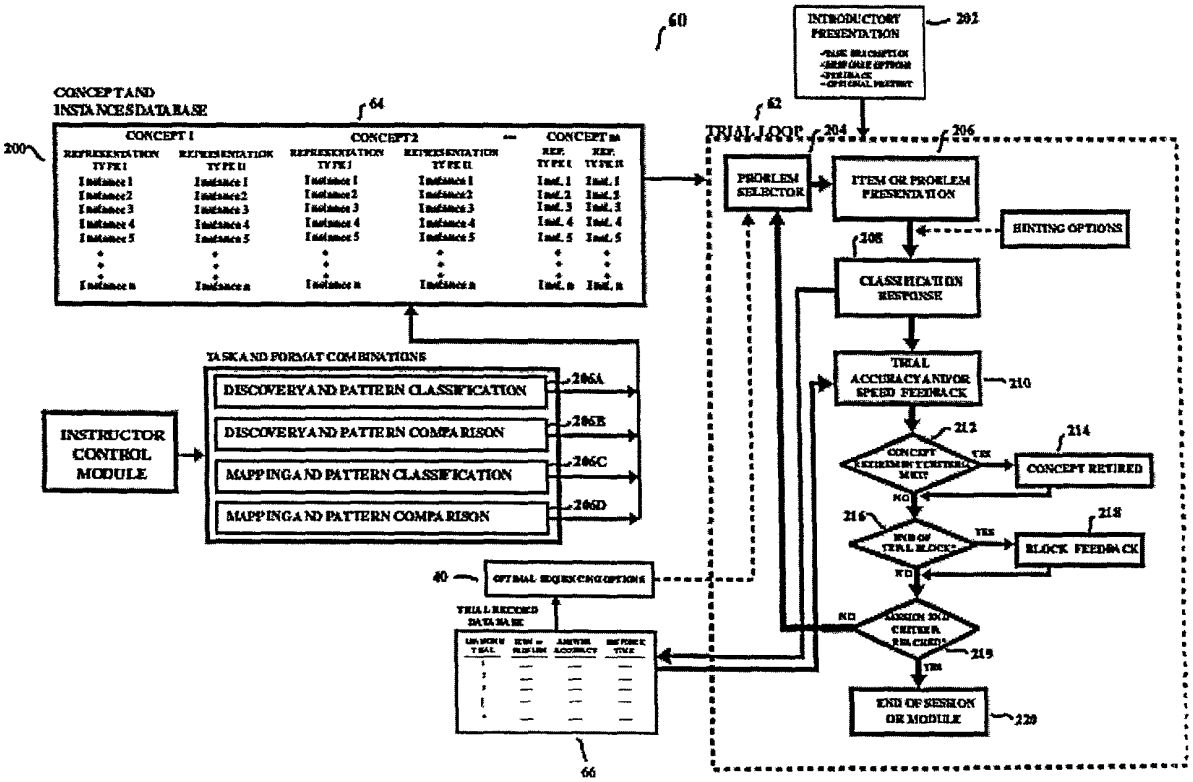


FIGURE 8. PERCEPTUAL LEARNING SYSTEM: *STRUCTURE DISCOVERY* VARIANT

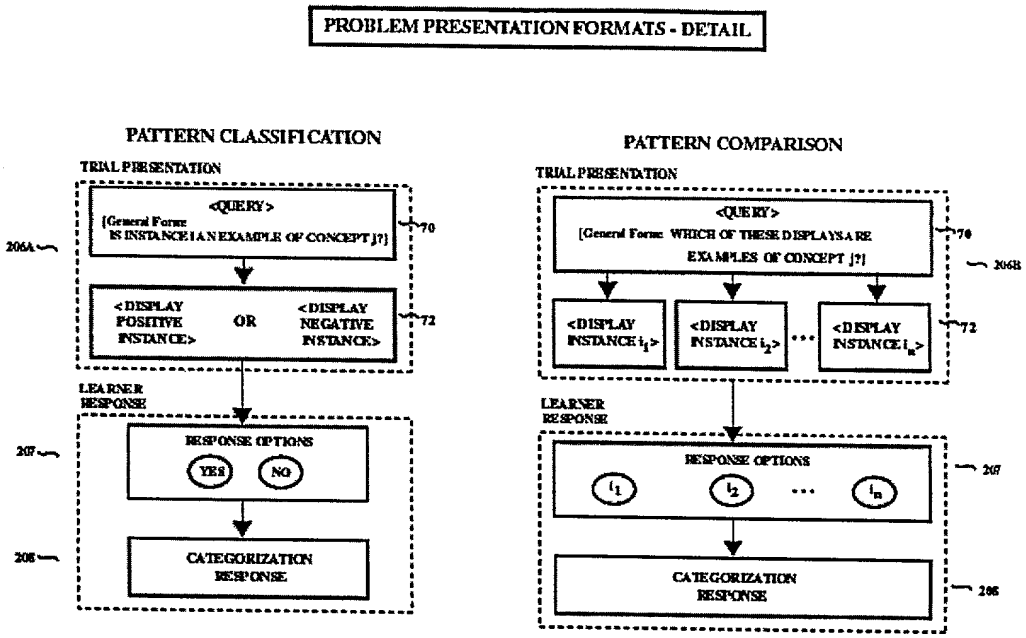


FIGURE 9. PERCEPTUAL LEARNING SYSTEM: *STRUCTURE MAPPING* VARIANT

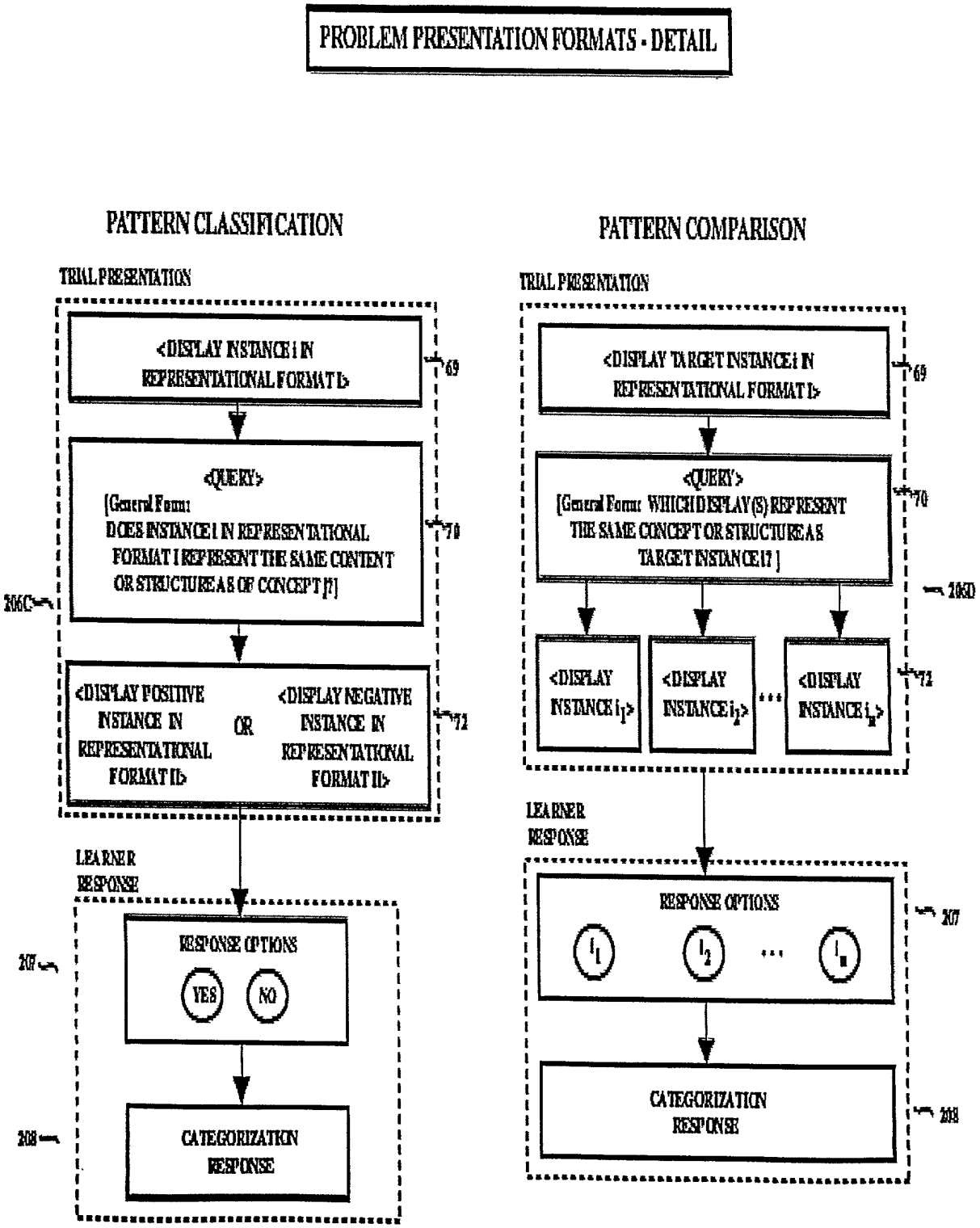
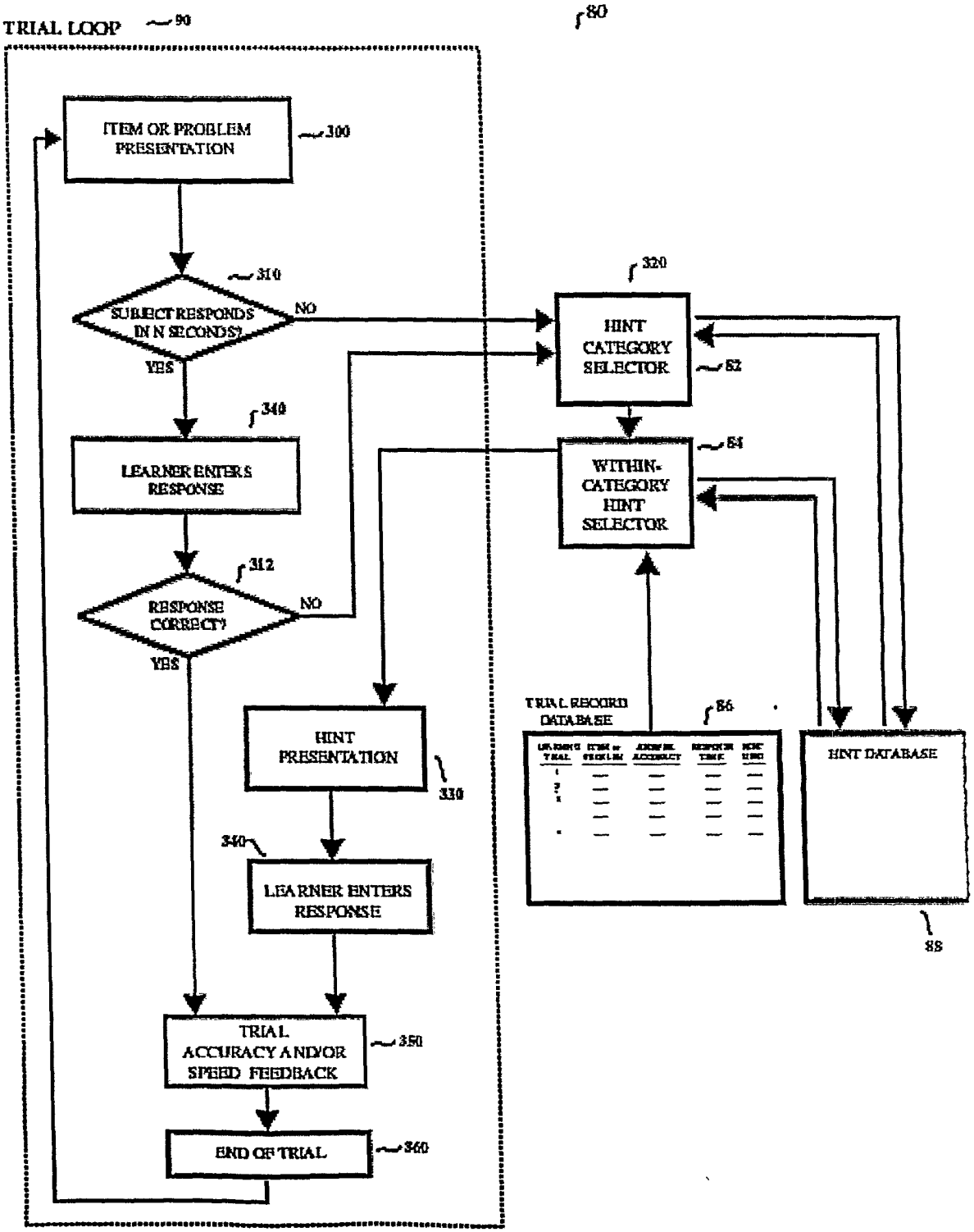


FIGURE 10

HINTING ALGORITHM: OVERVIEW



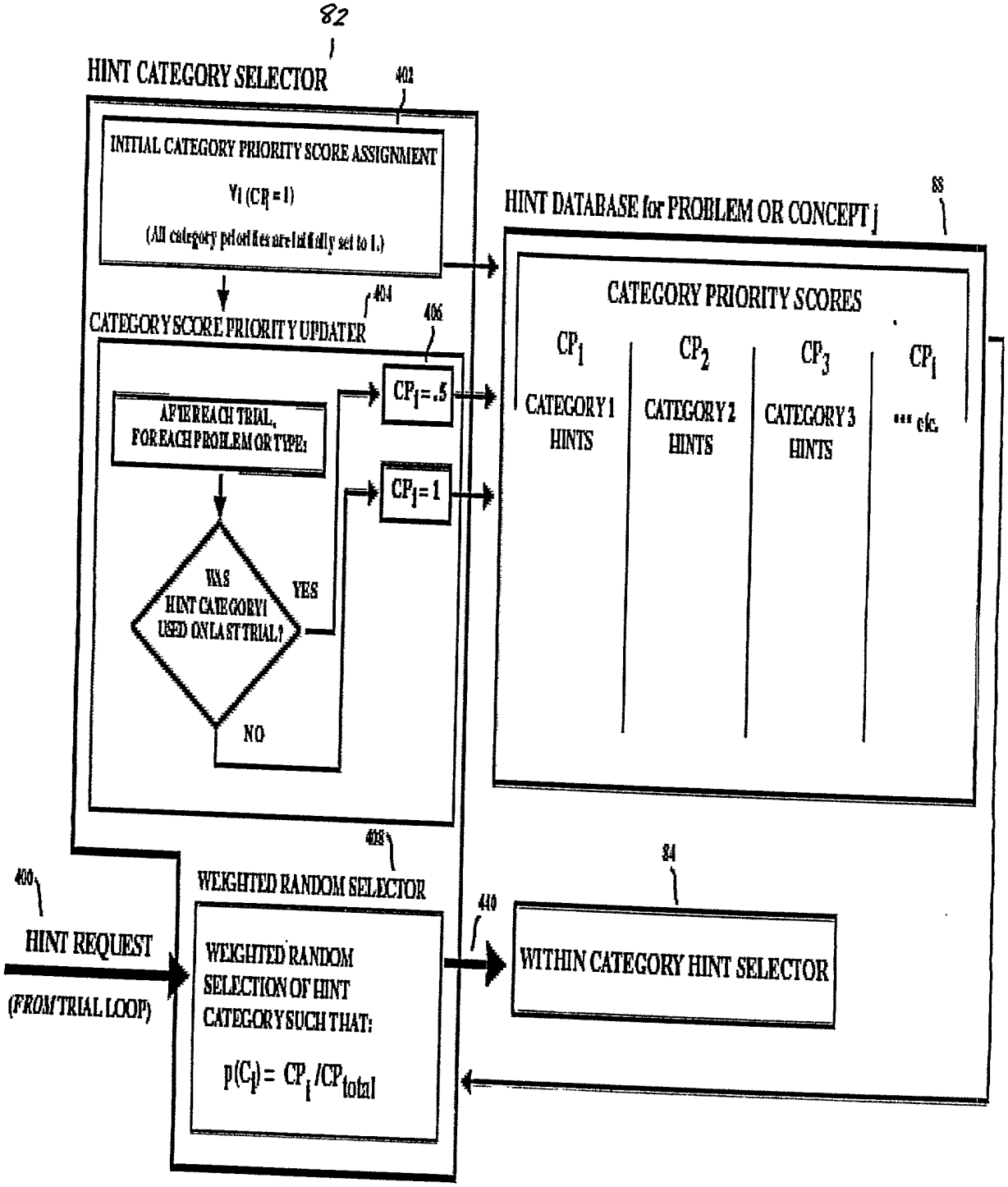


FIGURE 11. HINT CATEGORY SELECTOR

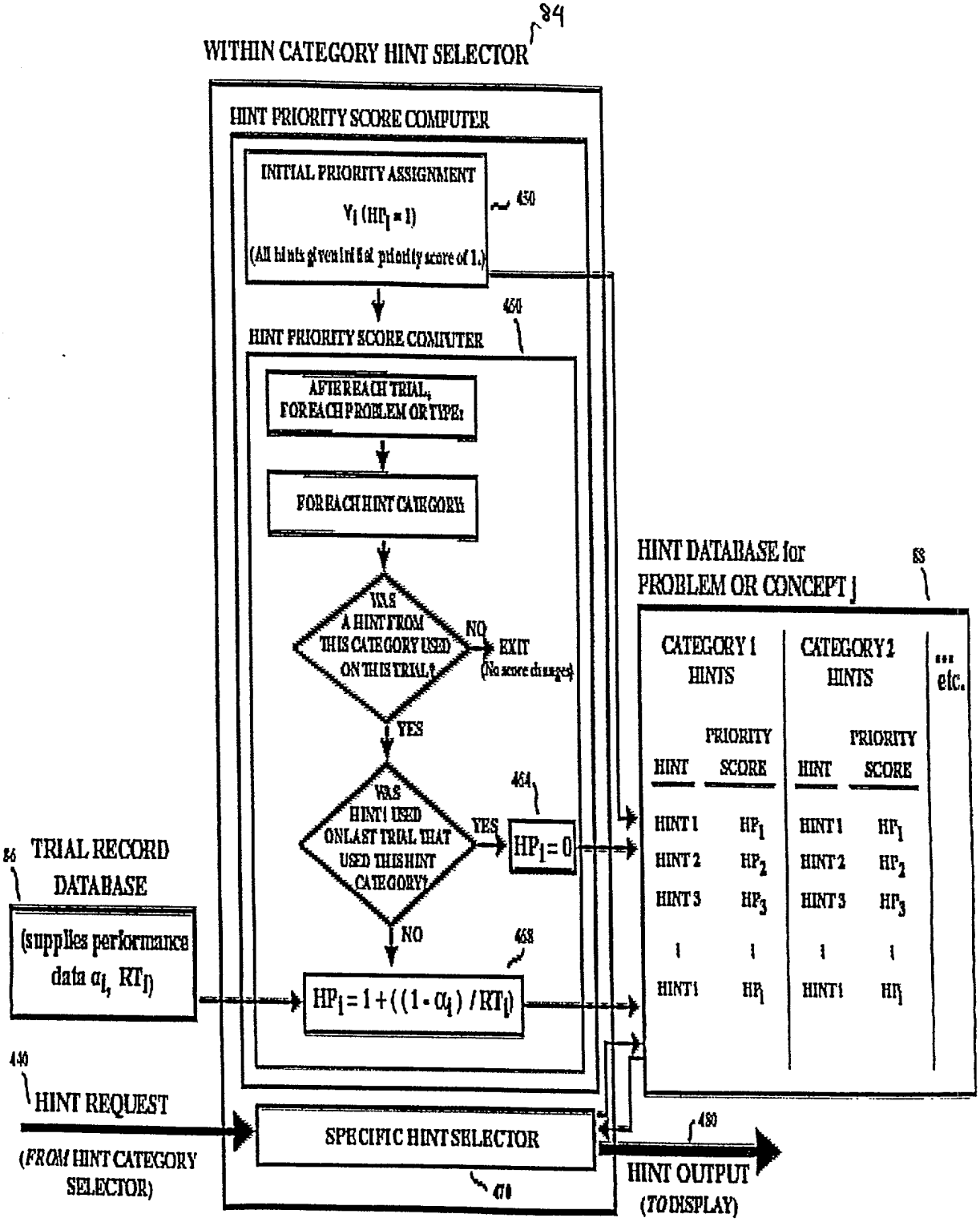


FIGURE 12. WITHIN-CATEGORY HINT SELECTOR